

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

REISSUE APPLICATION FOR LETTERS PATENT

INVENTOR: ANTHONY J. ANTONIOUS

TITLE: GOLF CLUB SHAFT AND INSERT THEREFOR

0954511-040600

Dr. B1

BACKGROUND OF THE INVENTION

The present invention relates to golf shafts and, in particular, an improved golf club shaft having a coil or coil-type insert for enhanced swing weight control, stiffness and flex control, shock absorption, vibration elimination or reduction, and other club improvements.

5           Conventional golf club shafts are made of steel, metal alloys or composite materials. Shafts have a tapered shape starting from the smaller tip end to the larger butt end and are normally formed with a continuous variable dimensional difference along the entire length of the shaft.

When a golfer hits a shot, the shaft is subjected to a number of complex forces during the swing, at impact, and during the follow through. Generally, conventional shafts have limited control over the swing weight of the club or the control of the torsion applied to the shaft during the swing. Similarly, conventional shafts do not control or adequately eliminate shock and vibration that transfer through the shaft to the golfer's hands, particularly at impact. Furthermore, conventional shafts have limited means to properly control the stiffness and the flexing of the shaft during the swing and therefore do not provide optimum shot control, power transfer and accuracy.

It is known that the stiffness and/or flexibility of the shaft as well as the flex points thereon can be varied to at least some degree to better fit the shaft to the physical parameters and swing characteristics of a particular golfer. However, the physical characteristics of conventional shafts and the costs associated with producing a properly "fitted" shaft obviously limits the degree to which a particular golfer can obtain or afford the best possible shaft for his or her swing.

There are a number of prior art patents dealing with shaft flexibility and variations in flex

Sh. B2

point. Some prior art patents of interest relating to golf shafts are shown in Design Patent No. 236,735 to Bush, U.S. Patent No. 5,022,652 to Fenton, British Patent No. 471,020, 1936, to TRI-ON, and U.S. Patent No. 5,316,299 to Fershe et al. In the inventor's opinion, these patents and the described inventions have not satisfied the need for a shaft or the combination of a shaft and club head which provides the most optimum characteristics, at an affordable price range for the majority of golfers worldwide.

009040"TT54560

## SUMMARY OF THE INVENTION

Among the objects of the present invention is to provide a golf club shaft which performs better at a relatively similar cost to conventional golf club shafts. Another object of the present invention is to provide a golf club shaft having a visible coil or coil-type insert, the combined  
5 shaft and insert allowing the selective location of the flex-point along the length of the shaft and the selective control of the stiffness of the shaft. Another object is to provide a shaft insert which can be used to more precisely alter the swing weight of a club. Yet another object is to provide a shaft insert which absorbs shock and greatly reduces or eliminates vibration caused by ground contact or impact with the ball. Still another object of the present invention is the provision of a golf club shaft having an insert which controls and generates torsional forces which combine with centrifugal forces to increase club head speed as the club head is swung to strike a golf ball.

Other objects and advantages of the present invention will become apparent from the following detailed description when viewed in conjunction with the accompanying drawings, which set forth certain embodiments of the invention. The objects and advantages of the  
15 invention will be realized and attained by means of the elements and combinations particularly pointed out in the appended claims.

To achieve the objects and in accordance with the purpose of the invention, as embodied and broadly described herein, the invention comprises a golf club shaft for a golf club head comprising at least one tubular section and an insert attached to at least one tubular section for  
20 regulating the flexibility of said shaft, the insert having a central section and a pair of couplers integrally formed on opposite ends of the central section, at least one of the couplers being

attached to the shaft.

To achieve the objects and in accordance with the purposes of the invention, as embodied and broadly described herein, the invention also comprises a golf club comprising a golf club head, a shaft interconnected at one end to the golf club head and at the opposite end to a grip and means for regulating the swing weight and flex point of club, said means including an insert having a central section and at least one coupler attached to the shaft.

As explained more thoroughly below, the present invention provides an improved shaft configuration suitable for all types of clubs used to play the game of golf. The addition of the visible insert regulates swing weight and maximizes specific desired flex and stiffness of the shaft. The improved shaft and insert preferably also cooperate to absorb shock at impact and control the torquing and proper uncoiling of the shaft during the shot. These inserts preferably include a coil or coil-like structure which acts as a buffer and/or vibrational dampener or suppressor, thereby providing greater cushioning to reduce or eliminate undesirable vibrations and shock, especially when off-center ball contact is made or "fat shots" occur.

Further, the proper application of the insert promotes greater club head stability at impact because of a quicker recovery capability of the shaft, facilitating the return of the club face to its original "square position". The desired flexing and precision control are accomplished by selecting the materials and physical characteristics of the insert (such as the proper number of coils, and the thickness of the coils) and properly locating the insert along the shaft. The insert of the present invention can also be varied in mass, size, shape, and location, to optimize the swing weight, flex point, and stiffness of a set of clubs. By varying these parameters, the shaft and

resultant club may be fitted to individual golfers or types of golfers of a wide variety of ability.

The shaft of the present invention includes an upper butt portion, an intermediate portion, a lower tip or club head portion, and an intermediate coil insert. The insert is provided with connectors on opposite ends of the coil. The connectors may be shank-type male or a receptor-type female in structure. A shank-type insert fits into the hosel socket of the club head or an adjoining shaft section, while a receptor-type connector fits over an adjoining shaft section.

The insert can either be placed in new shafts of new clubs, or can be added to existing shafts in old sets of clubs, thereby improving the old set. For example, sets of inserts of the present invention can be readily produced in standardized sets, to be sold as kits to alter an old set of clubs into an improved set of clubs having better performance. For example, the shafts of the old set can be cut at the desired location of the inserts, a short section of the shaft approximately equal to the length of the central section of the insert can be removed, and the insert can then be fixed to the remaining tip and butt portions of the shaft.

Preliminary tests conducted with iron and metal wood golf clubs using shafts having the coil or coil-type inserts of the present invention produced results that were superior in feel, control, distance, and accuracy over that of conventional clubs using the same composite material or metal shafts. Golf clubs with the present invention were easier to swing and control.

The insert of the present invention is preferably formed with surface or complete coils which serve to control and develop torsion forces as the golf club is swung. For example, on the back swing, left to right rotational movement of the club creates a coiling action within the coil-type insert to create a torsion-force. On the downswing, the built up torsion-force is uncoiled in

a right to left direction to develop an additional propulsion force. This additional force increases the club head speed developed by the centrifugal force of the golf swing, particularly when the flex point of the shaft is optimumly regulated by the insert.

It is to be understood that both the foregoing general description and the following  
5 detailed description are exemplary and explanatory only and are not restrictive of the invention as claimed.

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate several embodiments of the invention and, together with the description, serve to explain the principles of the invention.

0954511-040600

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a first embodiment of a golf club shaft insert in accordance with the present invention.

FIG. 2 is a perspective view of a golf club using a shaft in accordance with the present invention with the insert located adjacent the grip.

FIG. 3 is an exploded view of the shaft and coil insert of FIGS. 1 and 2.

FIG. 4 is an end view of the insert of Fig. 1.

FIG. 5 is a side elevational view of the insert of FIG. 1.

FIG. 6 is a perspective view of a second embodiment of the coil insert of the present invention.

FIG. 7 is a perspective view of a golf club using the shaft of the present invention with the coil insert of FIG. 6 located adjacent the club head.

FIG. 8 is an end elevational view of the insert of FIG. 6.

FIG. 9 is an end elevational view taken from the opposite end of FIG. 8.

FIG. 10 is a side elevational view of the insert of FIG. 6.

FIG. 11 is an exploded view of a golf club using the insert of FIG. 6.

FIG. 12 is a perspective view of a third embodiment of an insert in accordance with the present invention.

FIG. 13 is a perspective view of a fourth embodiment of an insert in accordance with the present invention.

FIG. 14 is an end elevational view of the insert of FIG. 13.





## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the present embodiments of the invention, and examples which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. It should be understood that the disclosed embodiments are merely exemplary of the invention, which may be embodied in various forms. Therefore, the details disclosed herein are not to be interpreted as limited, but merely as the basis for the claims and as a basis for teaching one skilled in the art how to make and/or use the invention.

Referring to FIGS. 1-5 of the drawings, the first embodiment of the invention is illustrated. As shown insert 12 is fixed to a conventional shaft 10 of a golf club, which in turn is attached at one end to a golf club head 24 and at the other end to a conventional grip 26. The shaft 10 itself can be formed of a variety of materials such as steel, graphite, fiberglass, and various alloys and composites, as is known in the art. The insert 12 forms a coupling means between an upper grip portion 14 of the shaft 10 and a lower club head or tip portion 16 of the shaft 10.

The insert 12 can be formed of a variety of materials and in a variety of shapes and sizes, although certain materials, shapes and sizes are preferred, as will be explained below. In all embodiments, the insert has a central section 18 connected at its opposite end to couplers 20 and 22. These couplers fit into or over the shaft 10 or the club head 24, in a manner such that a tight fit and strong connection can be made between the inset and the shaft or club head. Preferably, the insert and shaft or club head are permanently fixed to one another through the use of epoxy or a similar adhesive, although any acceptable connection technique is within the scope of the

invention. It is also possible that the insert could be incorporated into an extended hosel of a club head. The central section of the insert 12 in each preferred embodiment is positioned either between the club head and the shaft or between two portions of the shaft, adds to the length of the club, and is visible when installed on the shaft. The insert preferably has a boss on a male shank connector and a recessed opening on a female receptor, against which the shaft abuts thereby ensuring that the central section of the insert is properly joined and is of the desired length.

Regardless of the particular size, shape, and mass of the insert, the addition of the insert to the shaft regulates both the swing weight and the shaft flex point and stiffness of the resultant golf club. Thus, the characteristics and location of the insert can be varied, along with the other conventional elements of the club, to provide the most optimum flex point and swing weight of a given set of clubs.

Preferably, the insert 12 is constructed in a manner which allows the insert to affect the manner in which the shaft and the entire club responds to torsional forces as the club head is swung and to shocks and vibrations when the ground or ball is hit. The central section of the insert preferably includes physical alterations in its configuration that allow the insert to absorb the shock forces generated when the ball is hit. An insert with such alterations acts as a buffer and/or vibrational dampener or suppressor, thereby reducing or eliminating the transfer of undesirable vibrations and shocks to a golfer's hands. Inserts made of certain materials may be sufficiently resilient to act as a buffer and/or vibrational dampener or suppressor, without physical alteration.

Similarly, the insert preferably includes physical alterations or configurations that allow the insert to twist or turn slightly about its axis when the club head is swung. For example, the insert can include coils or a coil-like configuration providing a feature to control torsion. Thus, on the back swing, the insert undergoes a controlled coiling action that in effect produces stored energy in the insert at or about the top of the swing. On the downswing, the built up torsion-force in the insert is uncoiled to develop and impart an additional torsion, propulsion force to the golf ball at impact. Again, inserts made of certain resilient materials may provide this feature and function, without the need for physical alterations to the insert.

The first embodiment of an insert, shown in FIGS. 1-5, includes a centrally located coil or coil-type section 18 and an upper coupling member 20 and lower coupling member 22 disposed on either side of the central section 18. The coupling members 20 and 22 are integral with the central section of the insert and are structured to be connected to the upper portion 14 and lower portion 16 of the shaft 10, respectively. In this embodiment, the connectors 20 and 22 are male shank type connectors which are structured to be inserted into the shaft opening of the respective upper and lower portions of the shaft 10. The coil 18 is designed in a helical configuration formed between the connectors 20 and 22. In this embodiment a bore 21 extends through the entire length of the insert.

The insert 12 shown in FIG. 1 can be formed of a variety of metal and non-metallic materials and can be produced through a variety of machining or molding techniques. Presently, the preferred embodiment is an insert made of metal, preferably a steel, and most preferably a lighter and at least equally strong material, such as titanium. Titanium inserts are presently most

preferred, since such inserts are significantly lighter than steel and nevertheless have the necessary strength and semi-rigidity required.

As an example, an insert of the type shown in FIG.1 can be produced from a solid cylinder of titanium. The cylinder is machined to include a plurality of helically wound partial surface coils in the central section of the insert and two male shank couplers having a lesser outside diameter than that of the central section. The coils are in the form of a continuous arcuate bead formed on the surface of the central section, which still has a common, inner cylindrical wall along its length. The insert preferably is further machined to include a bore 21 throughout its length, thereby enhancing the coil-like characteristics of the central section while also reducing the total mass of the insert. As a result, the central section absorbs shocks and also will turn slightly about its axis when subjected to torsion.

In the embodiment shown in FIGS. 1-5 the helical surface coils are not cut through the entire cross section of the insert. The invention also contemplates, however, inserts in which the coils are made from a continuous, elongated member, so that the coils are separated from one another and form an actual helical spring. Such an embodiment is shown, by means of example only, in FIGS. 19 and 20. In that embodiment, the coils are actually spaced from one another. However, the invention also contemplates the use of a spring like insert in which the respective adjacent coils are in a touching relationship with each other.

As an example of a titanium insert made according to the first embodiment of the present invention, the insert has a plurality of partial surface coils, preferably at least four, having an outside diameter at the central section of 0.530 to 0.660 inches, a thickness (from inside diameter

of the central section to outside diameter of surface coil) of 0.125 to 0.170, and a coil spacing of 8 coils per inch. The coils in this embodiment have a width of approximately 0.100 to 0.125. The central section 18 preferably has a length of at least one-half inch, and the couplers 20 and 22 have a length of one to one and one half inches. The male-type shank couplers at the ends of the insert having outside diameters generally within the range of 0.370 to 0.435 inches, one coupler being slightly larger than the other. Preferably the couplers are frustroconical in shape to match the taper of the shaft into which they are inserted. For irons, the male shanks have a length of 1.250 inches and an outside diameter in the range of 0.408 to 0.435 inches. For woods, the male shanks have a length of 1.250 inches and an outside diameter in the range of 0.408 to 0.435 inches. The insert preferably has a bore 24 throughout its length, preferably so that the thickness of the couplers (inside diameter to outside diameter) is approximately 0.150 to 0.170 inches. The resultant insert has a weight of 15 to 30 grams. The resultant insert can absorb shock and turn slightly relative to torque forces, and yet is sufficiently strong and semi-rigid to alter the flex point and stiffness of the shaft and allow improved club head control throughout the swing of the club.

The insert of the present invention contemplates a number of alternate materials and configurations that can provide the desired objects of the invention and meet the elements and features presented in the claims. For example, it is believed that a wide variety of sizes and shapes of inserts, including a relatively simple cylindrical central section, will provide the features of the invention regarding the regulation of the desired flex point and swing weight of a golf club. It is believed that more complex designing is necessary to achieve the preferred combined features of swing weight regulation, shock cushioning, torsion control, and flex and stiffness regulation.

By means of example, the central section 18 can be machined to include a plurality of spaced coils or bands, rather than a helical configuration. Such an insert can be either machined or molded. It is further possible that an insert can be formed of special materials that provide the desired absorption and torsion characteristics through a cylindrical central section, with or without a bore. The invention thus includes all inserts that produce the claimed features provided by the specific embodiments and illustrations disclosed herein, as well as variations readily understood by the application of the principles of the invention disclosed herein.

As shown, the insert 12 in FIGS.1-5 is located directly below the grip of the golf club. At this location, the insert adds mass to the total club, but tends to reduce, rather than increase, the swing weight of the club. As a result, the club feels lighter and is easier to swing and control. In this embodiment, it is believed that the flex point of a given shaft is moved slightly downward, as long as the insert is as rigid or more rigid than the shaft, which is preferred. The insert's location and the type of shaft can therefore be altered to produce the most optimum characteristics in flex point, stiffness, and club control. It is believed that the added feature of torque control will be essentially the same, regardless of where the insert is located along the shaft. It is believed that the shock absorbing characteristics of the invention will be more effective when the insert is located closer to the club head. These and all aspects of the invention are the subject of further embodiments and testing, with the result that the description of the specific characteristics of the invention represent the applicant's best present understandings, based upon testing to date. Those tests have shown that golf clubs with the insert of the present invention provide repeatable benefits in feel, control, and performance over conventionally shafted clubs.

2. B3

FIGS. 6-11 show a golf club shaft 100 including a second embodiment of an insert 112. The insert 112 includes a coil 118, an upper female connector 120 and a lower male connector 122. As shown in FIG. 7, the insert 112 is positioned directly adjacent the hosel of a club head 124. The insert is preferably machined from titanium, in the manner previously taught, with the exception that the female connector has an outside diameter of approximately 0.360 and an inside bore of approximately 0.330. The diameter of the female connector will obviously vary to match the diameter of the shaft to which it will be connected. This embodiment has proven to provide excellent shock absorption characteristics, particularly for irons. While the placement of the insert at or near the club head adds to the swing weight of a given club, it also places more mass close to the ball, for greater force for a given acceleration at impact.

The present preferred placement of the insert for wood-type club heads is in the upper half of the shaft, more preferably the upper third of the shaft, and most preferably proximate (within three inches of) the bottom of the grip of a club. This placement also will work well with irons, but the inclusion of inserts at or near the club head is believed to be best for irons, particularly for a golfer having the ability to use an control clubs of greater swing weight. For golfers having less control, the preferable position of the insert for irons will be in the upper half of the shaft.

FIG. 12 illustrates another embodiment of an insert 212 including a centrally disposed coil 218, a lower male shank connector 22 and upper female connector 220.

FIGS. 13-17 show a fifth embodiment of a golf club shaft 300 including an insert 312 having a coil 318 and an upper female connector 320 and lower female connector 322. The embodiment of FIG. 15a is similar to that of FIG. 15 except that the centrally disposed coil 319



increases in diameter from each of the female connectors to a maximum at the center of coil 324. This embodiment provides an additional manner to vary the stiffness and flexibility of the shaft.

In each of these embodiments, the outside diameter of the central section can be larger for a given shaft size, since the female connector fits over the shaft. For example, as seen in FIGS. 16 and 17, an upper portion 314 of the shaft 300 fits into female connector 320, whereas a lower portion 316 of the shaft 300 fits into connector 322. In those figures, the insert 312 is placed approximately midway between the grip G and club head 324 positioning the flex point of the shaft 300 at this point.

FIG. 18 illustrates another embodiment of the present invention wherein a shaft insert 412 includes a solid central section 418. Such insert can be made of a variety of materials and can be either a one-piece construction or a multi-piece construction. For example, an insert having this configuration and made of a relatively rigid material such as steel or titanium would produce the swing weight and flex control features of the invention but would likely not absorb shock or control or generate torsion forces. On the other hand, an inset having this configuration but made in whole or in part from a material having certain resilient qualities could possibly provide each of these four features and still provide the necessary strength, semi-rigidity, and control. For example, this embodiment may be made from a Lexan or fiberglass composite.

FIGS. 19 and 20 illustrate another embodiment of the invention wherein a shaft insert 512 is formed by a stiff, coil spring with a male shank at each end of the stiff spring for connection to a shaft. Such an embodiment is particularly well suited to provide the shock absorption and torque control aspects of the invention.

FIG. 21 illustrates another embodiment of an insert 612 including a centrally disposed coil 618, a lower male shank connector 622 and upper female connector 620. This embodiment is similar in shape and construction to the titanium insert previously described, except that only four (4) coils are included in the central section. It has been found that such an insert provides the torsion control and absorption features of the invention and yet is particularly light in weight. Insert 612 may also include a boss 624 on the male shank side of insert 612. Although the other embodiments shown do not depict a boss, they may also include such a boss as shown in FIG. 21.

FIG. 22 shows a ninth embodiment of an insert according to the present invention. Insert 712 is similar to the embodiment of the insert shown in FIG. 21, except that insert 712 has an upper female connector 720 and lower female connector 722. Both inserts are similar to the insert illustrated in FIGS. 5, 10, and 13, but include only 4 coils.

FIG. 23 shows a tenth embodiment of an insert according to the present invention. Insert 812 has a wide, single coil 816, a lower male shank connector 822 and upper female connector 820 as shown for the insert FIG. 21.

It will be appreciated that any combination of male shank and female connectors may be used with a shaft in accordance with the present invention depending upon a variety of parameters including shaft material and the strengths thereof as well as the desired location of the insert.

It will be apparent to those skilled in the art that various modifications and variations can be made in the golf club shaft of the present invention and in construction of this golf club shaft without departing from the scope or spirit of the invention.